



The South African Institute for Computer Scientists and
Information Technologists

**ANNUAL RESEARCH AND DEVELOPMENT
SYMPOSIUM**

23-24 NOVEMBER 1998

CAPE TOWN

Van Riebeeck hotel in Gordons Bay

Hosted by the University of Cape Town in association with the CSSA,
Potchefstroom University for CHE and
The University of Natal

PROCEEDINGS

EDITED BY
D. PETKOV AND L. VENTER

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PROCEEDINGS

**EDITED BY
D. PETKOV AND L. VENTER**

SYMPOSIUM THEME:

Development of a quality academic CS/IS infrastructure in South Africa

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FOREWORD

The South African Institute for Computer Scientists and Information Technologists (SAICSIT) promotes the cooperation of academics and industry in the area of research and development in Computer Science, Information Systems and Technology and Software Engineering. The culmination of its activities throughout the year is the annual research symposium. This book is a collection of papers presented at the 1998 such event taking place on the 23rd and 24th of November in Gordons Bay, Cape Town. The Conference is hosted by the Department of Information Systems, University of Cape Town in cooperation with the Department of Computer Science, Potchefstroom University for CHE and and Department of Computer Science and Information Systems of the University of Natal, Pietermaritzburg.

There are a total of 46 papers. The speakers represent practitioners and academics from all the major Universities and Technikons in the country. The number of industry based authors has increased compared to previous years.

We would like to express our gratitude to the referees and the paper contributors for their hard work on the papers included in this volume. The Organising and Programme Committees would like to thank the keynote speaker, Prof M.C.Jackson, Dean, University of Lincolnshire and Humberside, United Kingdom, President of the International Federation for Systems Research as well as the Computer Society of South Africa and The University of Cape Town for the cooperation as well as the management and staff of the Potchefstroom University for CHE and the University of Natal for their support and for making this event a success.

Giel Hattingh, Paul Licker, Lucas Venter and Don Petkov

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A PARTITIONING SCHEME FOR SOLVING THE EXACT k -ITEM 0-1 KNAPSACK PROBLEM

M.F. Kruger and J.M. Hattingh
Potchefstroom University for CHE

Abstract

Our investigation on the impact of partitioning the search space of the classical 0-1 Knapsack Problem through the inclusion of equality constraints on the knapsack's cardinality, has given rise to the study we undertook on solving the Exact k -item 0-1 Knapsack Problem (EKP) and proving optimality. This problem also arises in the solution of real-life cutting stock problems by column generation in which the number of pieces cut from each stock is limited by the number of knives available.

In this paper we explore a partitioning scheme on the Exact k -item 0-1 Knapsack Problem. We introduce equality constraints on the number of items outside the break solution, which must be selected for inclusion into the knapsack. This can be seen as *constraint disaggregation*. As a result of this, we do a *forrest seach*, i.e. instead of searching one tree, more trees (in general) are searched. We present results of numerical experiments.